Supporting Information for:

Carbon nanodots as dual-mode nanosensors for selective detection of hydrogen peroxide

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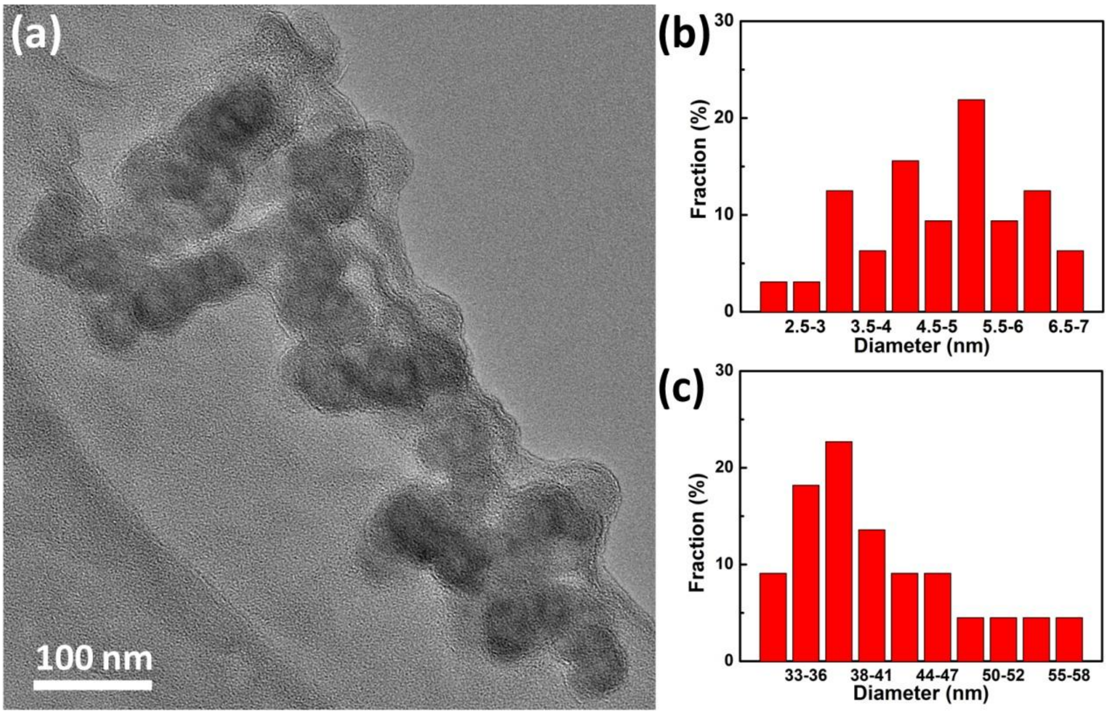

Figure S1. (a) TEM image of CDs after adding 0.5 M H_2O_2. (b,c) Histogram of distribution from TEM before (b) and (c) after adding 0.5 M H_2O_2.

From the histogram and TEM image, the diameters of the CDs after adding H_2O_2 enlarge about ten times, which are considered to be the aggregation of CDs from H_2O_2.

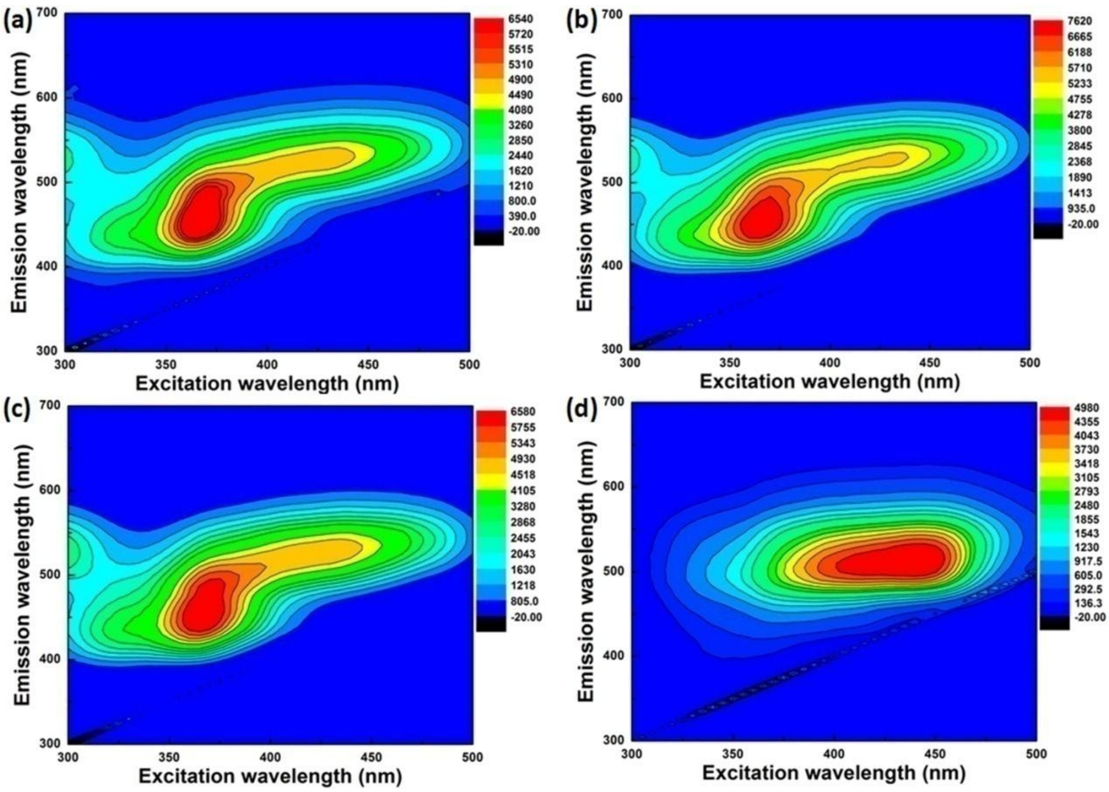

Figure S2. Excited-emission matrix of the CDs with 2500 rpm (a), 5000 rpm(b), 7500 rpm(c) centrifugation and with the addition in 0.5 M H_2O_2 (d).

The excited-emission matrix of the CDs with 2500 rpm, 5000 rpm and 7500 rpm centrifugation can prove the dual-emission fluorescence is from one kind of CDs with the same size.

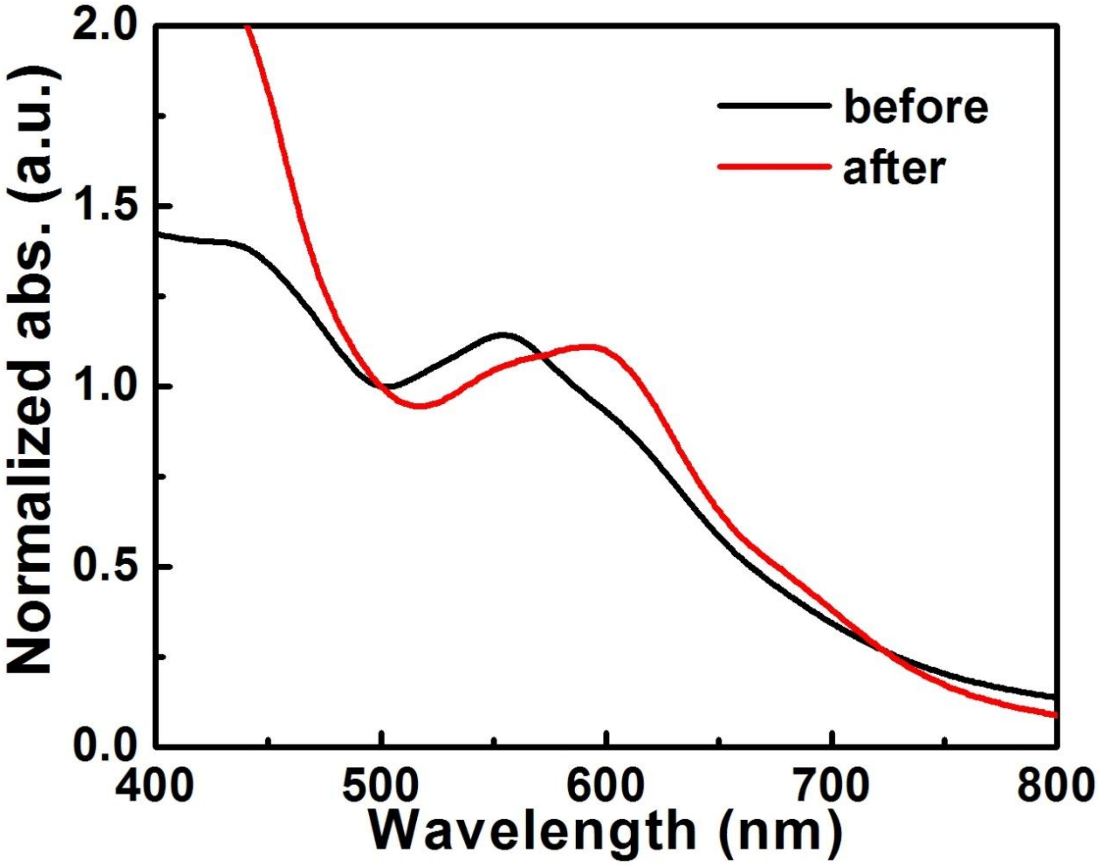

Figure S3. Absorption spectrum of the CDs normalized at 500 nm before and after adding 0.5 M H_2O_2.

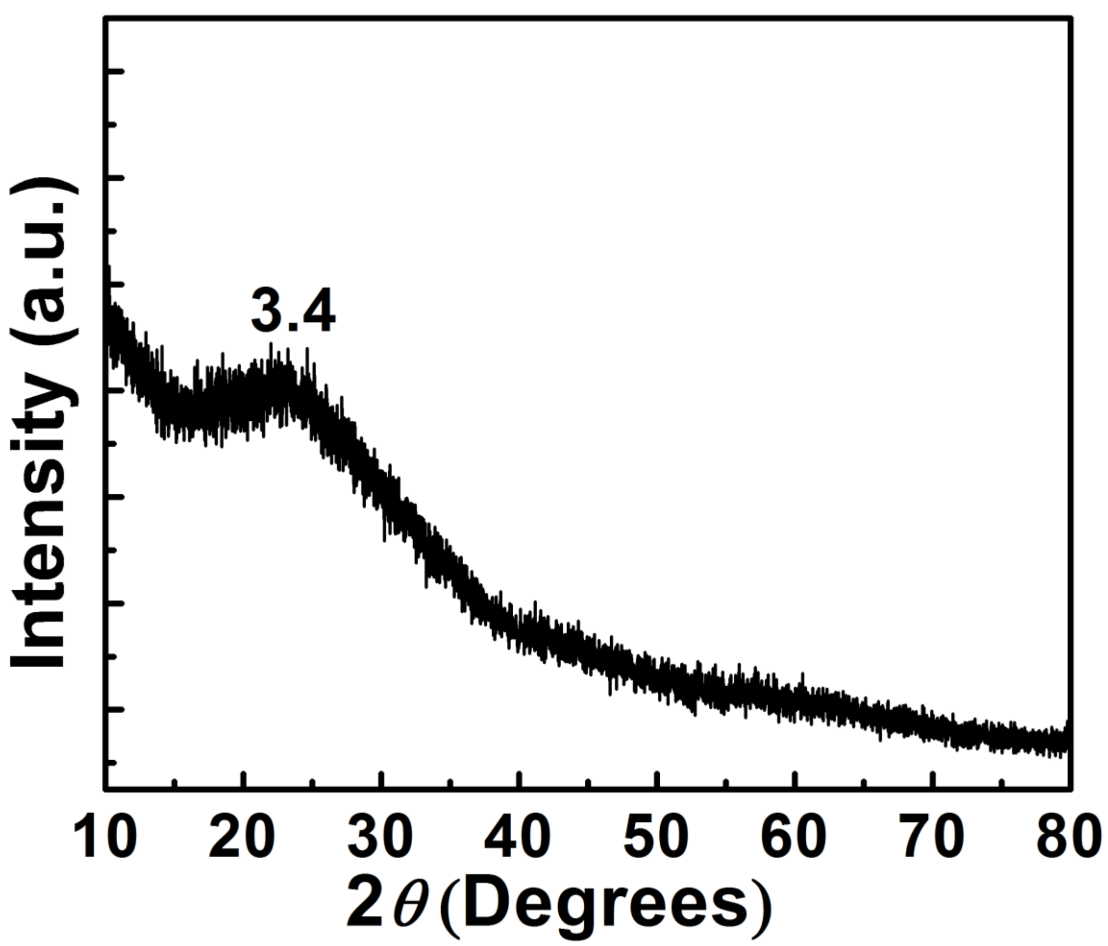

Figure S4. XRD pattern of the CDs after adding 0.5 M H_2O_2.

The XRD spectra of the CDs before and after adding H_2O_2 alter little.

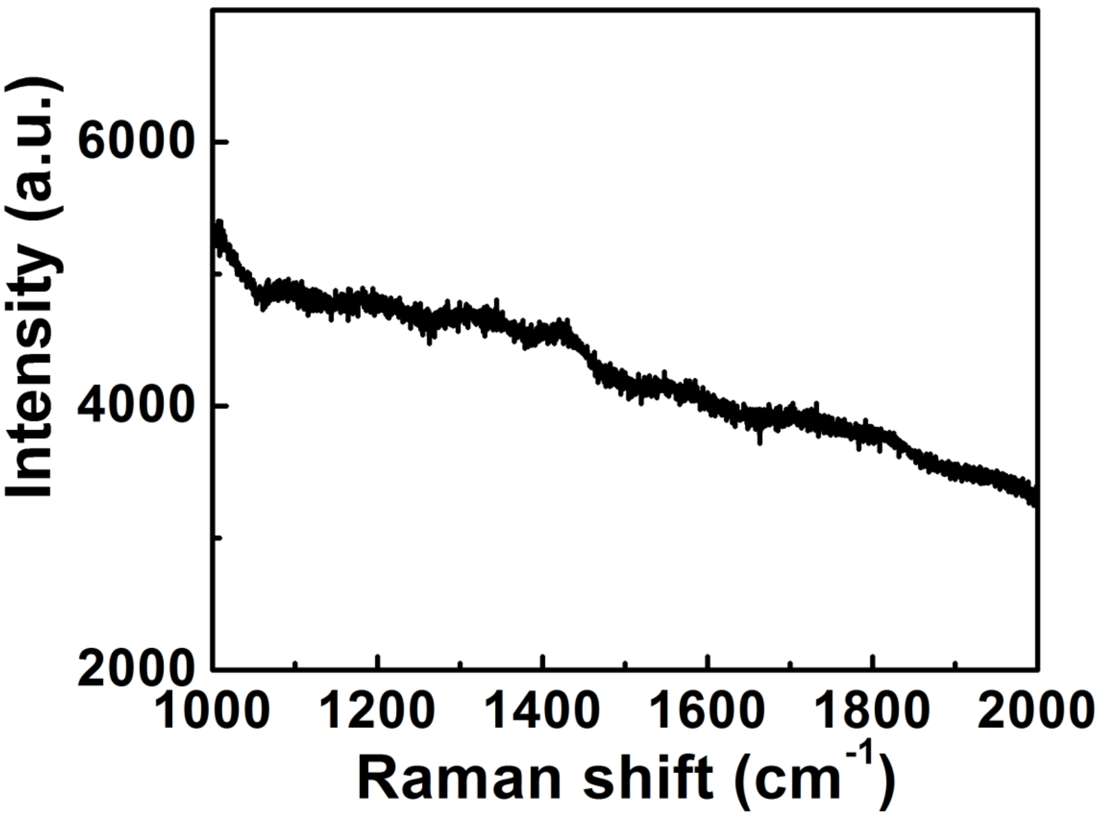

Figure S5. Raman spectrum of the CDs after adding 0.5 M H_2O_2.

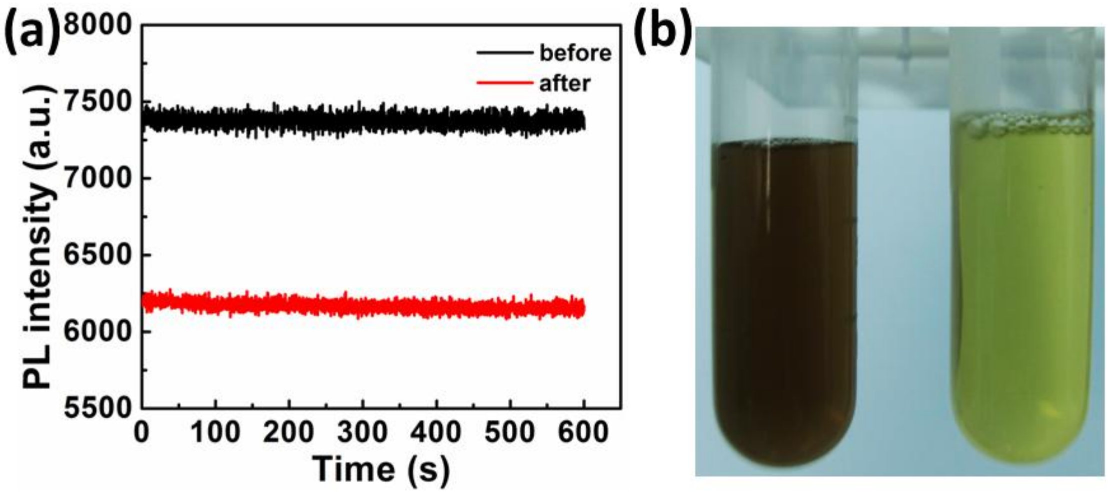

Figure S6. (a) Fluorescence stability of the CDs before and after adding 0.5 M H_2O_2 with the emission at 450 nm and 500 nm, respectively. (b) Photographic images of the CDs and the CDs under 1M H_2O_2 after 3 day.

The fluorescence stability of the CDs before and after adding H_2O_2 changes little.

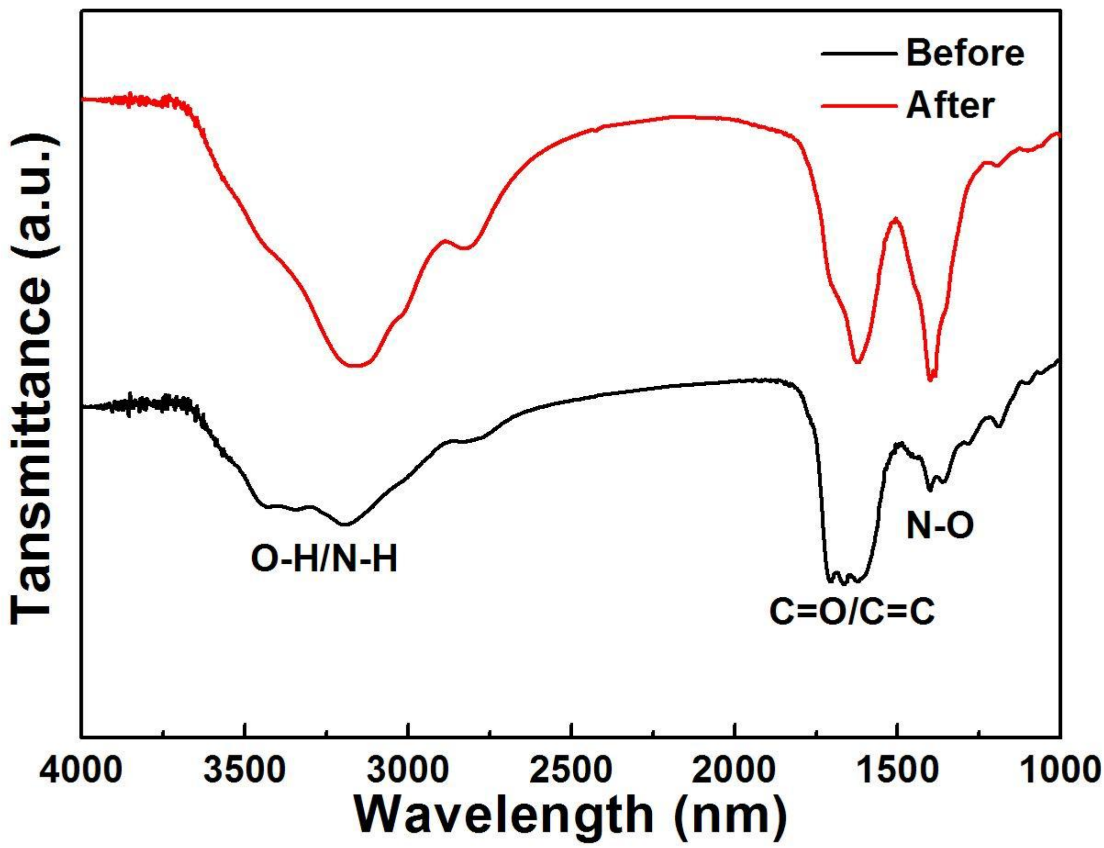

Figure S7. FTIR spectra of the CDs before and after adding 0.5 M H_2O_2.

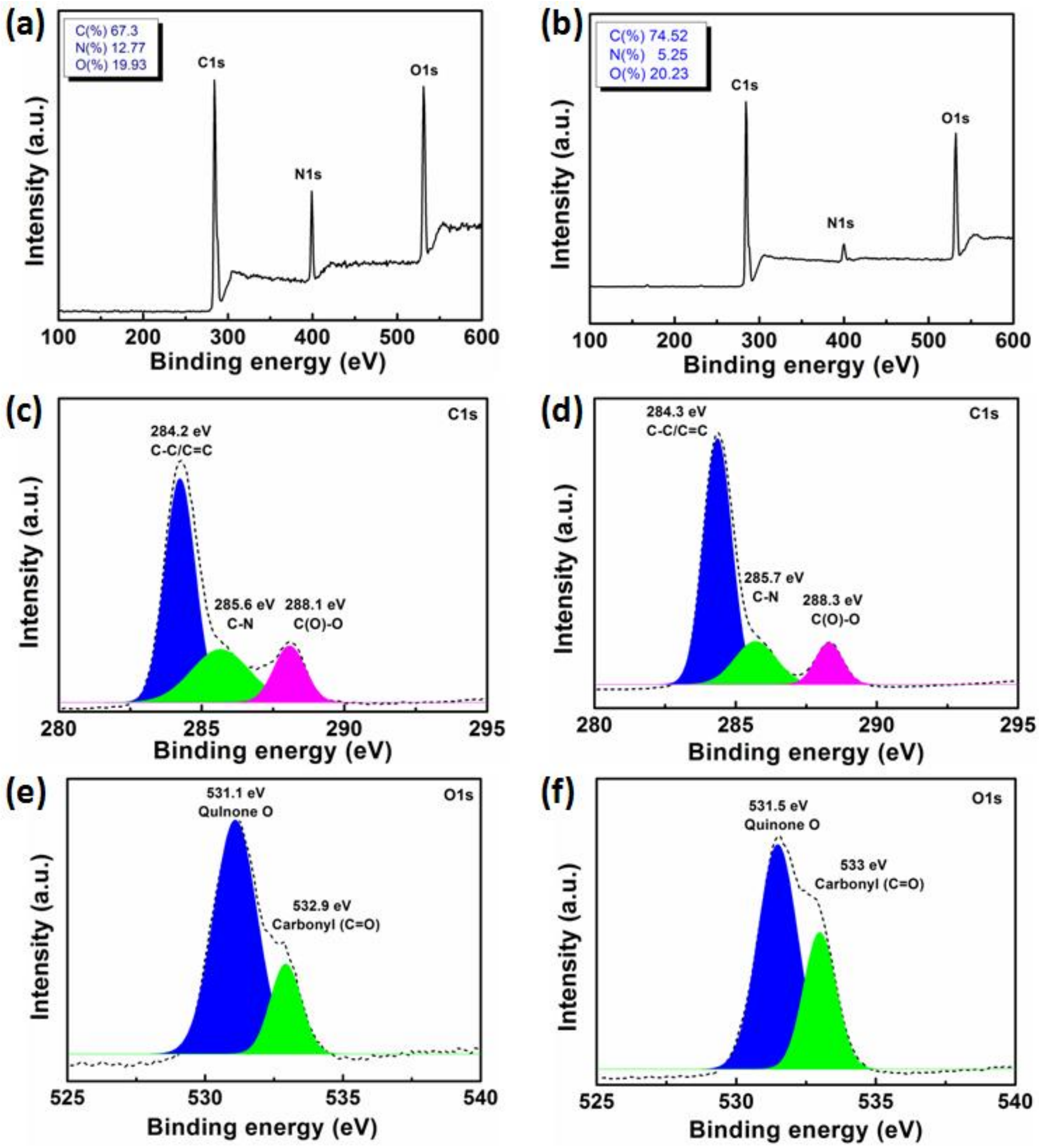

Figure S8. (a,b) XPS (full survey) of the CDs before (a) and after (b) adding 0.5 M H_2O_2. (c,d) XPS (C1s) of CDs before (c) and after (d) adding 0.5 M H_2O_2. (e,f) XPS (O1s) of CDs before (e) and after (f) adding 0.5 M H_2O_2.

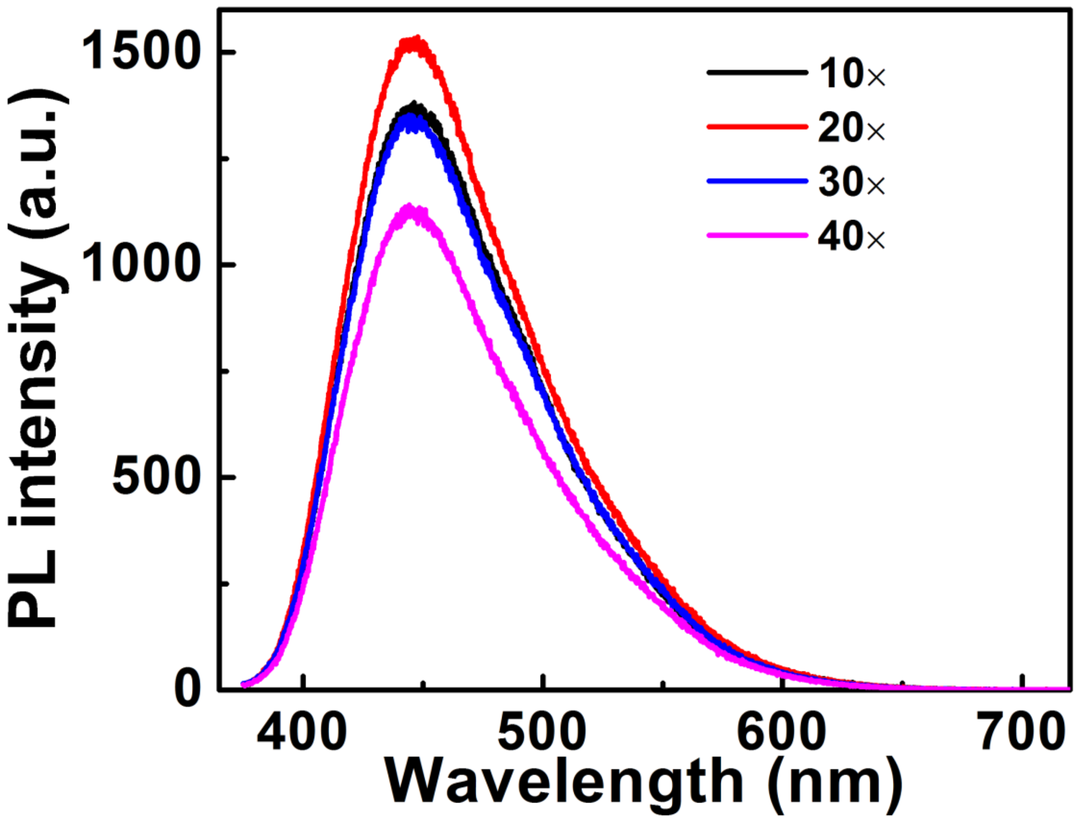

Figure S9. The fluorescence intensity of the 112.5 μg mL^{-1} CDs diluted for 10, 20, 30 and 40 times.

The high concentration may induce the fluorescence quenching of the CDs. So, the CDs should be diluted with a proper concentration (30x, 3.75 μg mL^{-1}) for increasing the accuracy of the nanosensor based on the CDs.

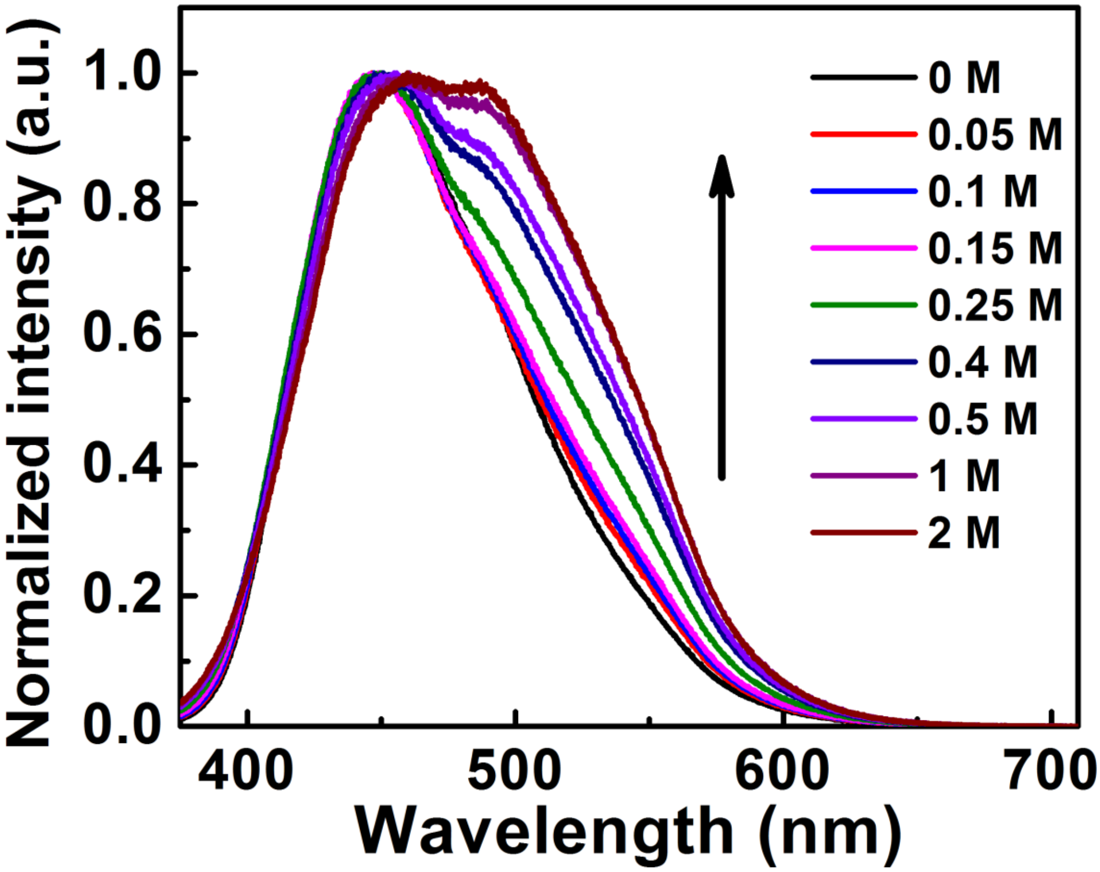

Figure S10. The normalized fluorescence intensity of the CDs under different concentrations of H_2O_2 (0, 0.05, 0.1, 0.15, 0.25, 0.5, 1 and 2 M, from left to right).

With increasing the concentrations of H_2O_2, the fluorescence intensity of the CDs at 500 nm obviously is enhanced.

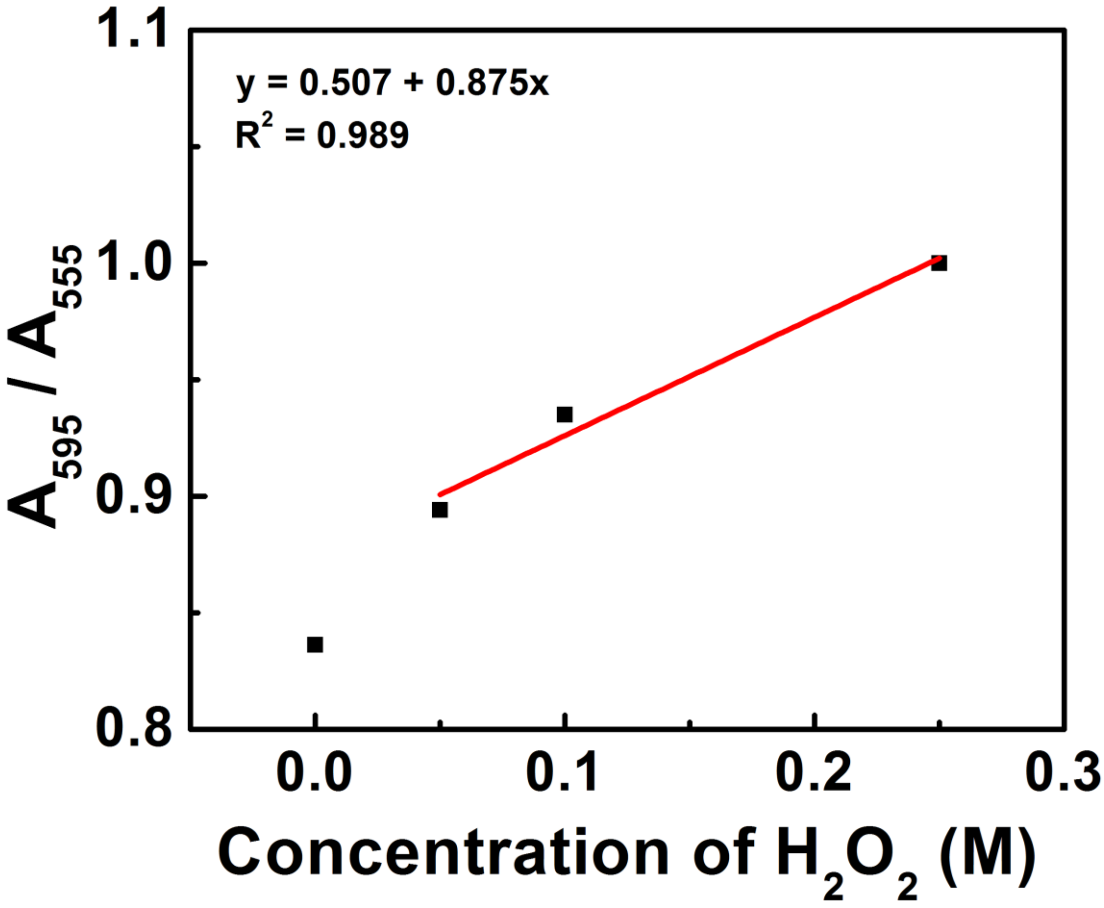

Figure S11. The liner range of the absorption for sensing H_2O_2.

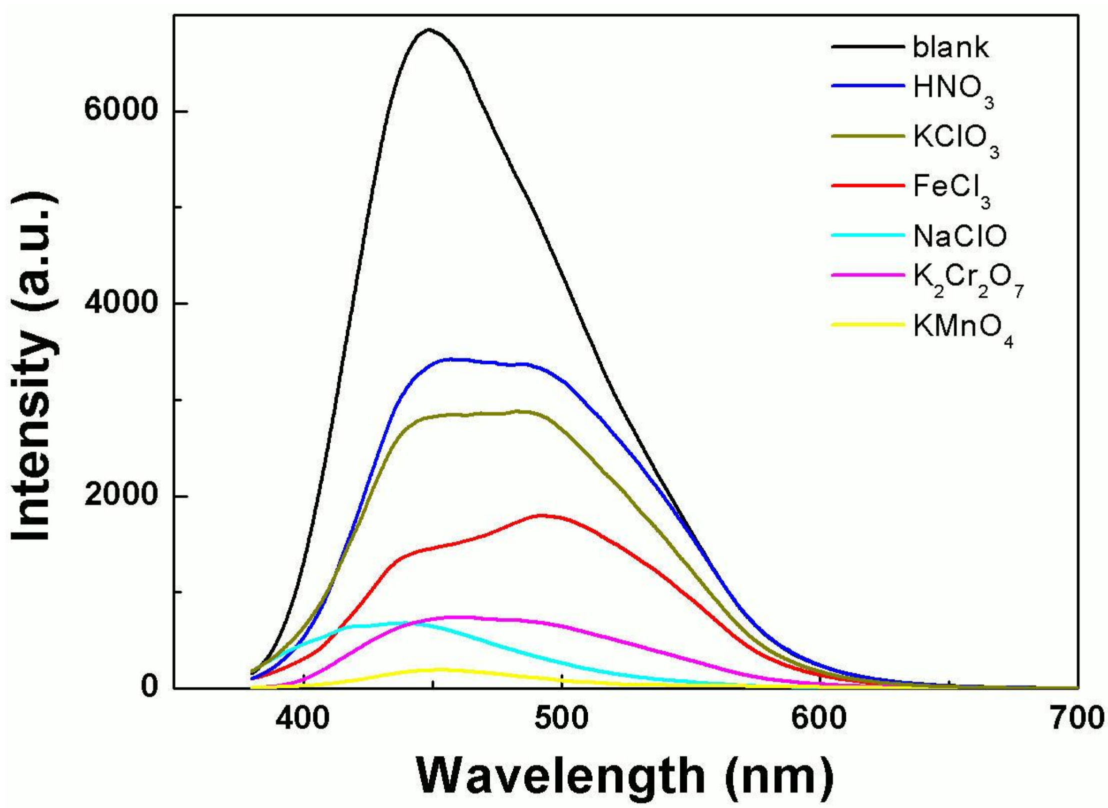

Figure S12. Fluorescence spectra of CDs in the presence of different oxidants.

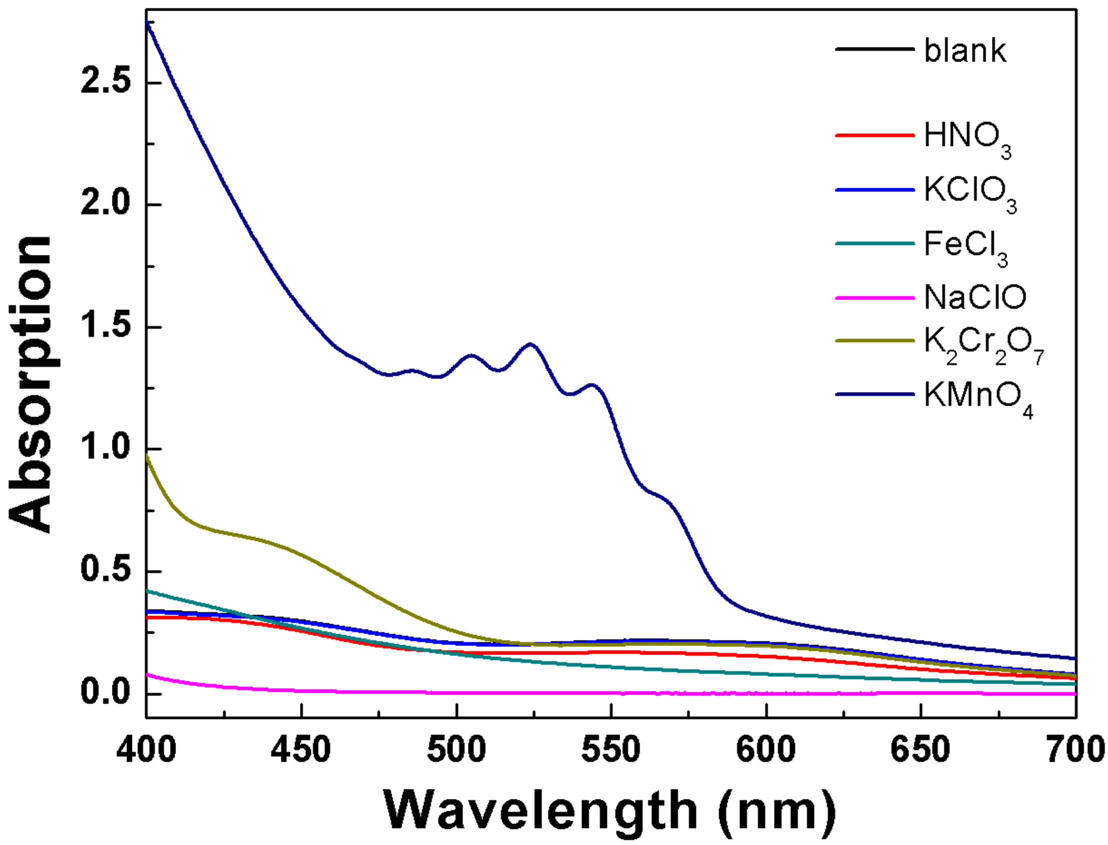

Figure S13. UV-vis spectra of CDs in the presence of different oxidants.

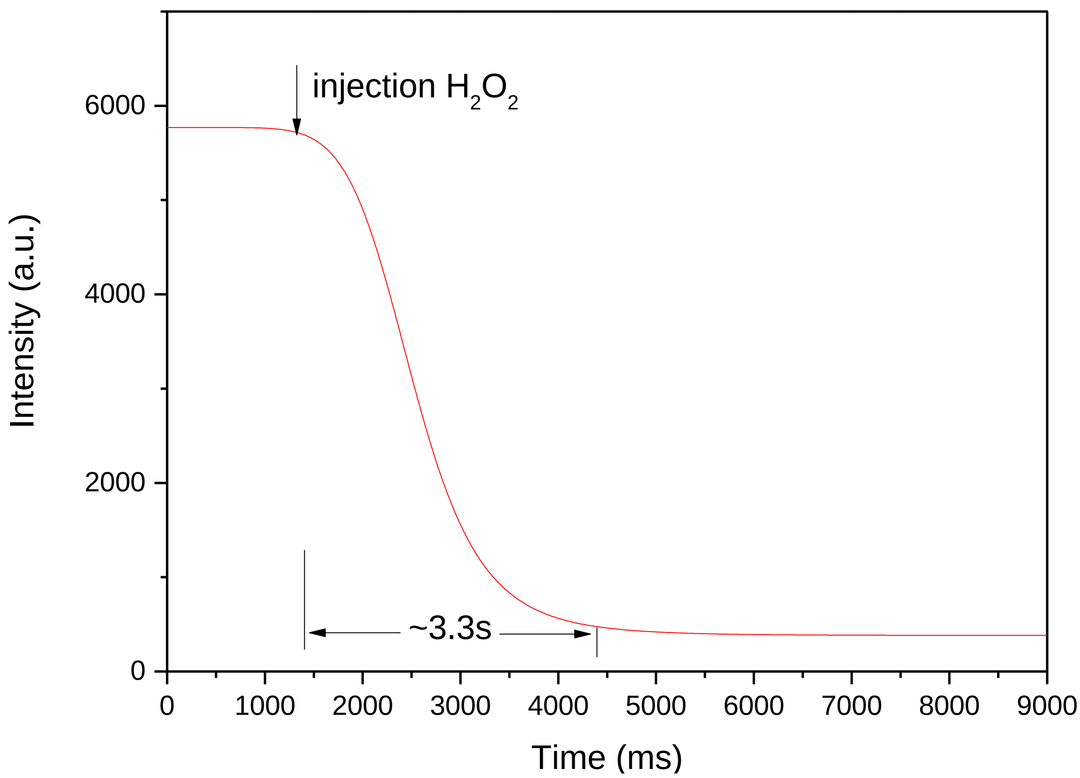

Figure S14. The fluorescence intensity varied with time after injecting H_2O_2.

Table S1. Limit of detection (LOD) of CDs sensor for H_2O_2

1	0.57062	11	0.57339
2	0.57068	12	0.57407
3	0.57217	13	0.5737
4	0.57029	14	0.57469
5	0.57011	15	0.57456
6	0.57134	16	0.5737
7	0.56819	17	0.573
8	0.57313	18	0.57362
9	0.57228	19	0.5729
10	0.56779	20	0.57937

The LOD rule of IUPAC: LOD = (k*b)/S

k=3, S was the slope of calibration curve, b was the tandard deviation of blank.

Calibration：S = 0.547，b = 0.00256，so LOD = 0.014M.

Table S2. Comparison of analytical performance of different nanosensors for H_2O_2 determination.

Sensing materials	Method	Linear range	LOD [a)]	Remark	Ref.
Au-Ag/C nanoclusters	Colorimetry	0.8-90, 90-500 μM	0.3 μM	Noble metals	1
SiO_2NPs-HRP [b)]	Colorimetry	1.2-72 μM	1.3 μM	Complicated operation with enzyme reaction	2
CNT/AgNPs	Electrochemistry	0.05-17mM	0.5 μM	Complicated operation and noble metals	3
Gr-CCS-AgNPs [c)]	Electrochemistry	20μM- 5.02mM	2.49μM	Complicated operation and noble metals	4
Au NC	Fluorescence	0.161-19.32 mM	20 μM	Difficulty for naked-eye detection and noble metals	5
dLys-AgNCs [d)]	Fluorescence	0.8-200μM	0.2μM	Difficulty for naked-eye detection and noble metals	7
polymer nanoparticles	Fluorescence	6-1000μM	2.0μM	Difficulty for naked-eye detection	9
CQD-HRP [e)]	Fluorescence	0.5-50 μM	0.2μM	Difficulty for naked-eye detection and operation with enzyme reaction	10
Carbon dots	Fluorescence and colorimetry	0.05-0.5M	50 mM	Simple and visualization by naked eye	This work

[a)] Limit of detection. [b)] SiO_2 nanoparticles and horse radish peroxidase. [c)] Silver nanoparticles selectively deposited on graphene-colloidal carbon sphere composite. [d)] Lysozyme-silver nanoclusters. [e)] Carbon quantum dots and horse radish peroxidase.

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